THE WESTERN GAS CONSTRUCTION CO.

GAS ENGINEERS AND BUILDERS

SAN FRANCISCO FORT WAYNE, IND. NEW YORK

BULLETIN No. 240.

BUILDERS OF GAS HOLDERS

SINGLE AND MULTIPLE LIFT.

SINGLE LIFT.

Capacity Cu. Ft.	Dia. Space Required.
1,000	18′0″
2,000	22′0″
3,000	24′0″
5,000	28′0″
10,000	36′0
15,000	40′0″
20,000	44′0″
25,000	48′0′
30,000	50′0″
40,000	56′0″
50,000	58′0″
60,000	66′0″
75,000	68′0″
100,000	74′0″

DOUBLE LIFT.

50,000	52′0″
60,000	54′0″
80,000	60′0″
100,000	64′0″
125,000	66′0″
150,000	72′0″
200,000	82′0″
300,000	94′0″
400,000	102′0″
500,000	112′0″

TRIPLE LIFT.

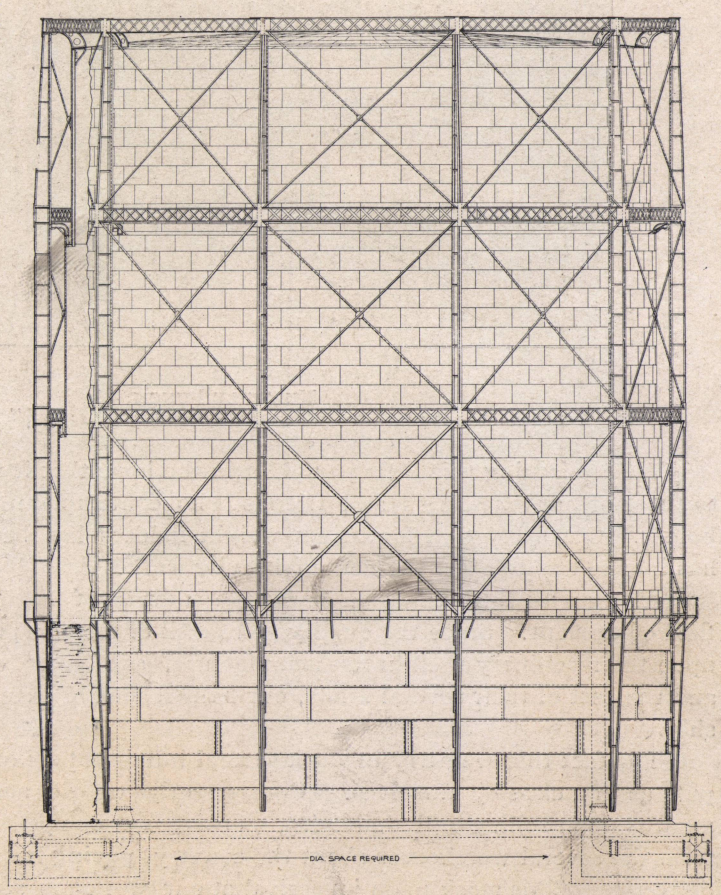
300.000	82′0″
450,000	94′0″
500,000	98′0″
600,000	106′0″
750,000	112′0″
900,000	122′0″
1.000,000	126′0″

QUADRUPLE LIFT

1,500,000	138′0″
2,000,000	158′0″
3,000,000	184′0″

QUINTUPLE LIFT

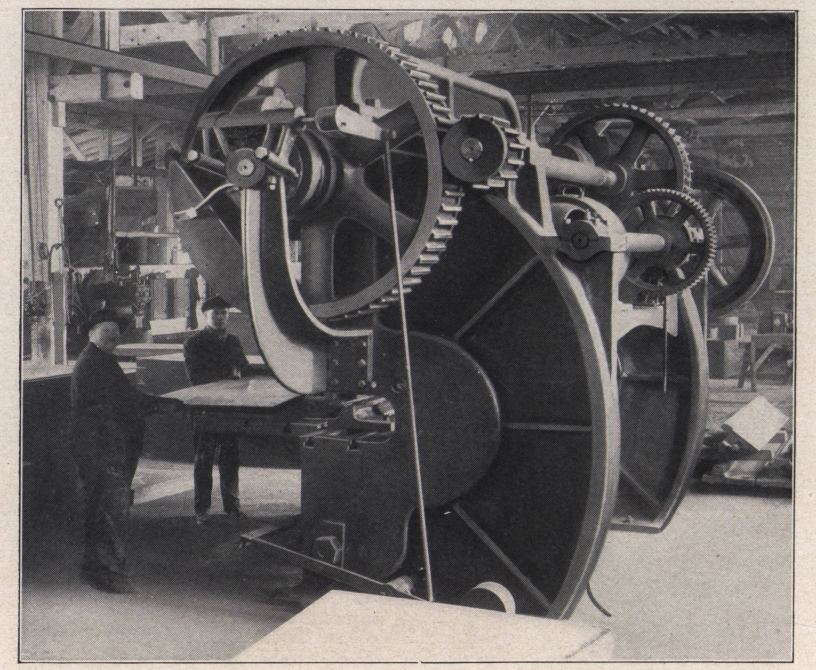
5,000,000	210′0″



SPACE REQUIRED EQUALS DIAMETER FOUNDATION CUT TO OUT PLUS A REASONABLE AMOUNT OF CLEARANCE, VARYING WITH SIZE OF HOLDER.

The Western Gas Construction Co.

OUR GAS HOLDER INDUSTRY.



MULTIPLE PUNCH.
One of our machines rated to punch 90 $\frac{5}{16}$" holes through $\frac{1}{4}$" blue annealed steel and shear the edge at one stroke.

We are issuing this little pamphlet in the hope that it will be of some benefit to those of our customers and friends who contemplate the erection of a new holder. Our success with medium weight holders has been most flattering and has inspired us to enter the field of heavier work.

Equipment

Along with this expansion comes the addition of heavy shop machinery and field equipment. Since the quality and finish of factory products depend largely upon the machinery used in its manufacture, and since our machines are new and the best of their several kinds, our holders should excel in point of workmanship.

Stock Materials

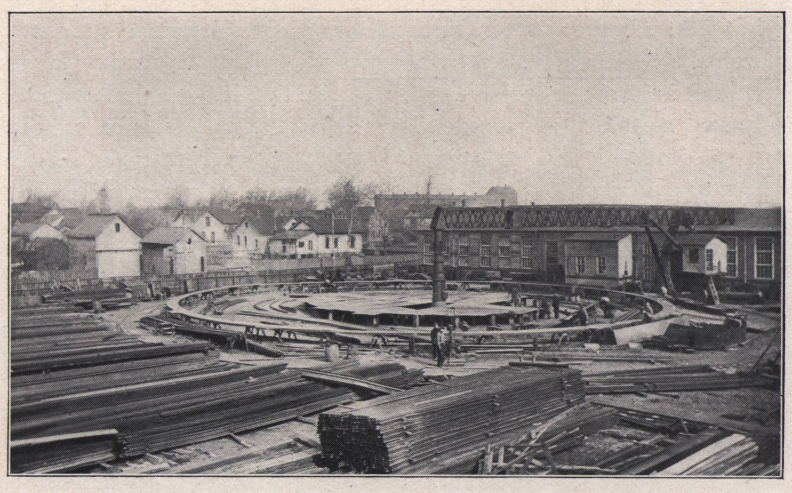
The fact that we carry in stock several hundred tons of raw holder materials puts us in a class by ourselves. Consequently we do not have to wait several months upon rolling mill deliveries, nor are we compelled to buy our materials from the several warehouses about the country, paying heavy premiums for prompt deliveries. This stock upon its arrival at our works is seasoned a short time to facilitate the removal of mill scale, etc., after which it is given a protective coating, and stored in stock houses. Upon receipt of an order we can begin shipment at once, and can give our customers more tonnage with a fair profit to ourselves, at a much lower figure than any of our competitors who have to go to the warehouses for their materials.

Working Forces

It must not be inferred from what we say about our new modern machinery for fabricating holder materials that our Engineers and Mechanics have newly entered this kind of work. We have engaged men who are experts in their several lines, and are turning out first-class products, from the view point of quality, workmanship and efficiency. Our plate work scraped clean and riveted, iron to iron, makes a positive joint.

Correct Design

At this time nothing will be said of the history nor evolution of the gas holder, further than, in many cases it has been and is still being built from a design drawn up from some "hit or miss" method of calculations or guesswork—the stresses were thought to be indeterminate. Consequently many holders have been wrecked from time to time, some even before the tank had been filled with water. Since the invention and evolution of the higher mathematics, we are able to analyze these redundant and noncoplanar forces, hence every rivet and bar has its function in the properly proportioned structure.



VIEW OF HOLDER—SHOP YARD,
Showing Electric Traveler for handling Materials and Compression Riveters.
This Traveler has a reach of 164 feet.

Steel Water Tank

In connection with the steel tank, our special double welt butt-joints deserve attention—the tank is no stronger than its joints. This is a point that is often overlooked by customers, and the salesman who has to offer the heaviest plates receives favor. At the same time his tank may be the weakest, due to inferior joints. Our butt-joints are designed to give an efficiency of about 92 per cent. of the solid plate.

Gas Container

The container or bell may consist of one, two, three or four lifts, depending upon various conditions. The sections of the multiple lift container are connected with a grip and cup filled with water, forming an hydraulic seal. The plates of this seal are constantly in contact with water and air and rapidly corrode. They

should be made heavy at the outset, and should be kept well painted. Our containers consist of a heavy steel frame, or skeleton, made of circular curbs and verticals, to which the plating is properly secured. We use no wicking, red lead, nor wash of salammoniac in our plate seams, they being carefully riveted metal to metal.

Guide Frame.

Upon the guide frame depends the appearance and symmetry of the structure. To make a guide frame that is pleasing from an architectural point of view, combined with maximum strength, is our aim.

The story runs that in gas holder construction, the tangential guide rollers distributing the wind loads over about one-half of the columns were used by the French, the radial roller which transmits the wind loads to about one-third of the columns was used by the Germans, and an Englishman combined the two, making an ideal carriage—a carriage which distributes the wind load over three-fourths of the columns of the guide frame at all times. Likewise in our heavier guide frames, we have combined the best features of modern gas-holder construction, namely, the deep trussed column, with the torsion brace and lattice box girders, and have developed a frame in which no eccentric loading exists, all members are in the form of bars exposing a minimum surface to the wind and corrosive action of the atmosphere, and we believe for strength and rigidity it is not surpassed.

Gas Pressures

Since the views taken by gas men as to just what pressure a holder should throw, are so diverse, it seems appropriate that we here make mention of this feature. The prevailing idea is, that the greater the presure of gas due to the weight of the container or bell, the better and heavier is the holder. The principle involved here may be compared to that of an engine cylinder (the water being the piston) where the greater the area of piston the less the pressure required to move the load. The pressure varies inversely as the square of the diameter. Consequently we may get any desired gas pressure with the lightest construction by modifying the diameter to suit.

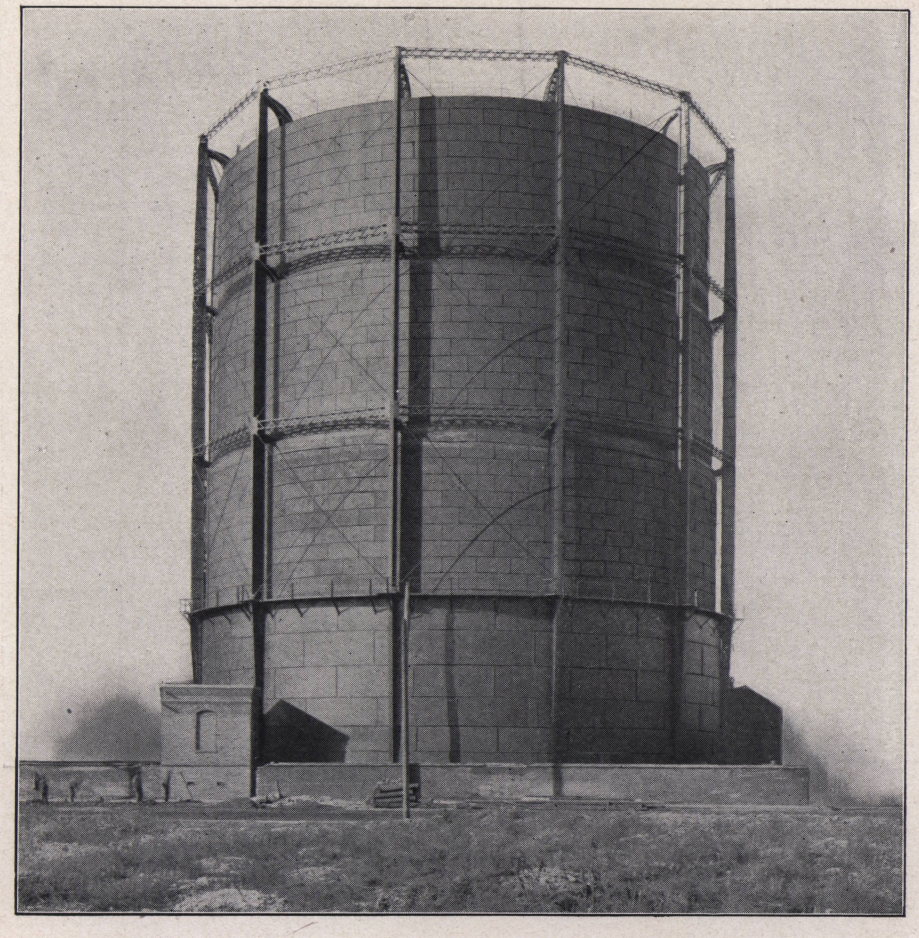
For the economical operation of a gas works the holders should not throw any more pressure than is absolutely necessary to furnish the proper pressure to the consumer. Any weight above this absorbs energy from the exhausters and is lost in the form of heat. To illustrate, let us take for example the inner section of a 500,000 cubic foot three lift holder, having a diameter of 90 feet and traveling 90 feet during its rise. The weight required on this diameter to cause a 1 inch water pressure is about 33,000 pounds. Therefore every inch of excessive pressure thrown by this holder causes a waste of energy of 90 horsepower-hours for every half million cubic feet of gas passing through it.

Care of Holder

A properly constructed gas holder requires very little care or attention. The guide rollers should be lubricated about once a month and at the same time inspected to see that they are moving freely and are not cramped in any way. The holder should be painted when necessary to prevent rusting, and if a good quality of paint is used, it will be necessary to do this about every two or three years. The necessity for painting will become apparent from inspection, and at no time should the surface of the iron be exposed to the atmosphere, as rusting and pitting of the sheets will follow very quickly on account of their alternate exposure to

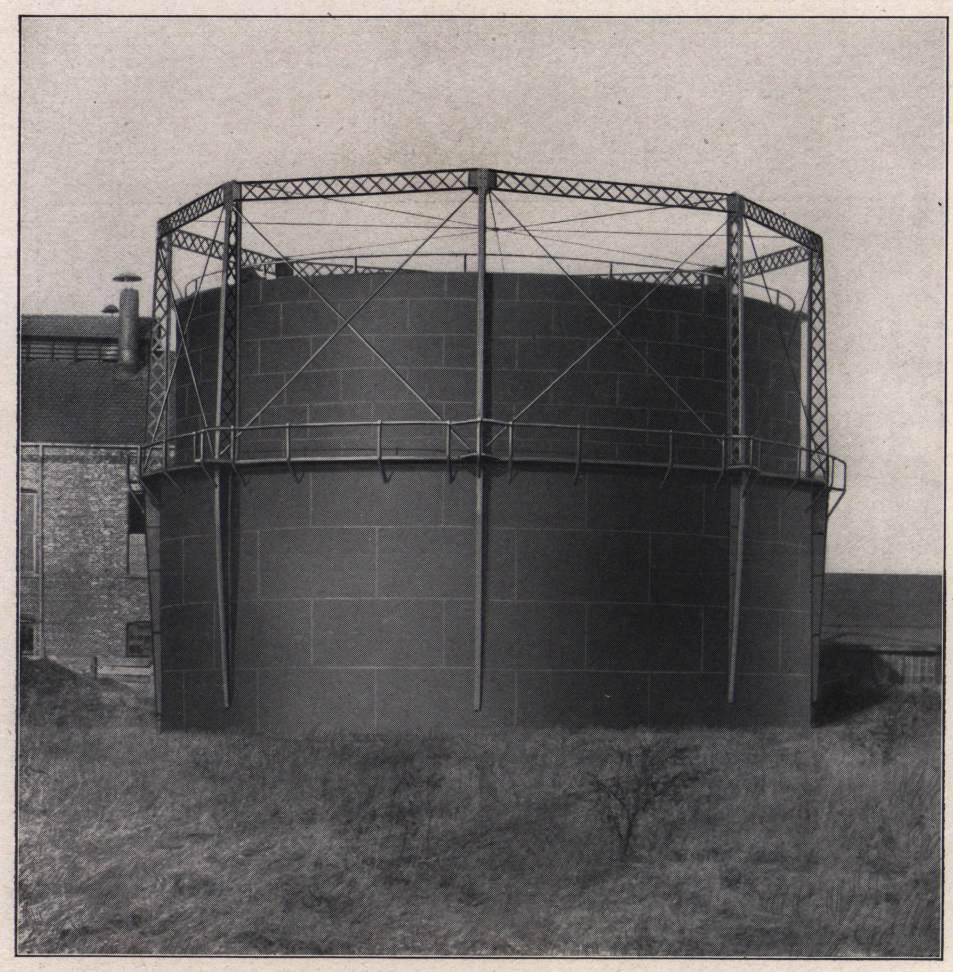
water and air. The bottom of the cups should be gone over with a spoon scraper at periods of three to four months apart to remove any stones or other debris which may have accumulated in them. The gas holder is a shining mark for the small boy with a rock or a brick bat in his hand. Of course, means must be taken to prevent the water freezing in the cups and at the top of the tanks during cold weather. Outside of the above attention practically no further care is required, except in cases of accidental injury.

If it should be necessary at any time to empty the water from the holder tank in order to make repairs or for any other reason, it should be borne in mind that a vent must be opened to the holder before proceeding to drain the tank, otherwise a vacum will be formed and the crown of the holder collapse. This is generally done by taking off the manhead cover located on the crown.

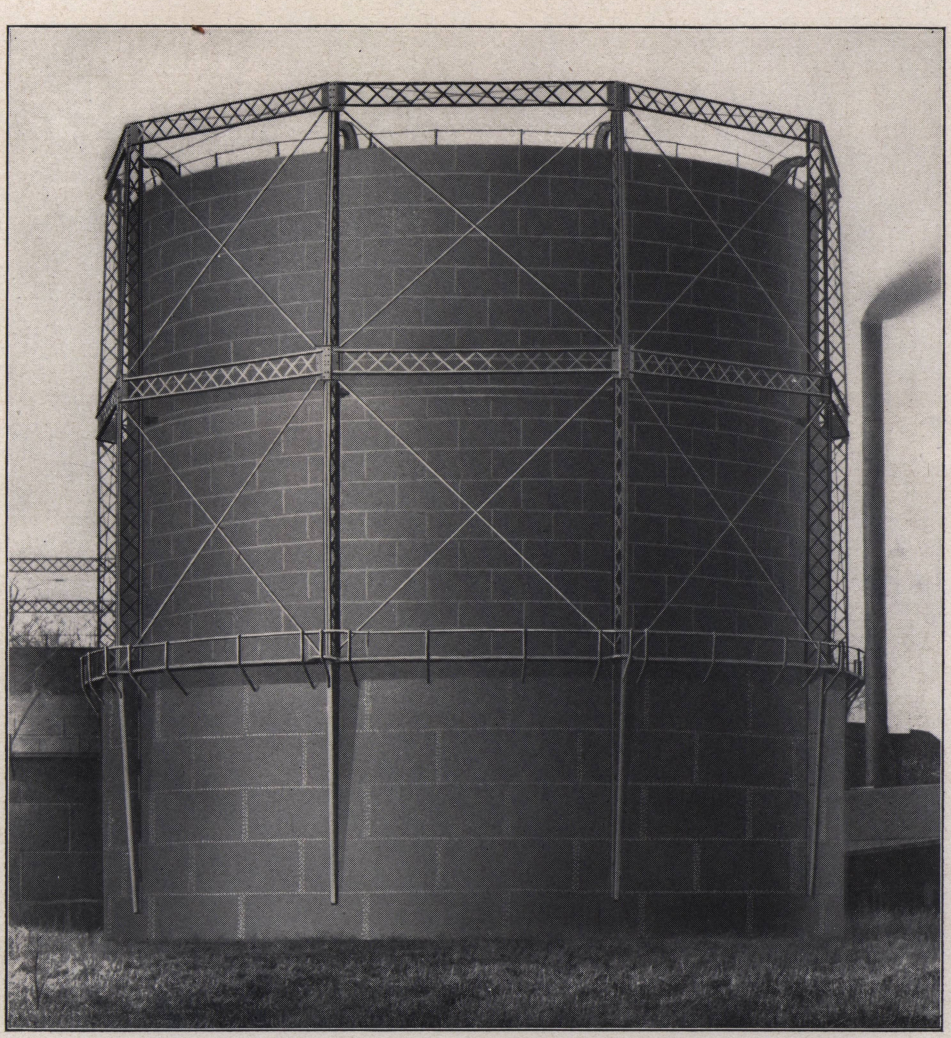


THE ABOVE IS A CUT OF ONE OF OUR THREE LIFT HOLDERS HAVING A CAPACITY OF 700,000 CU. FT.

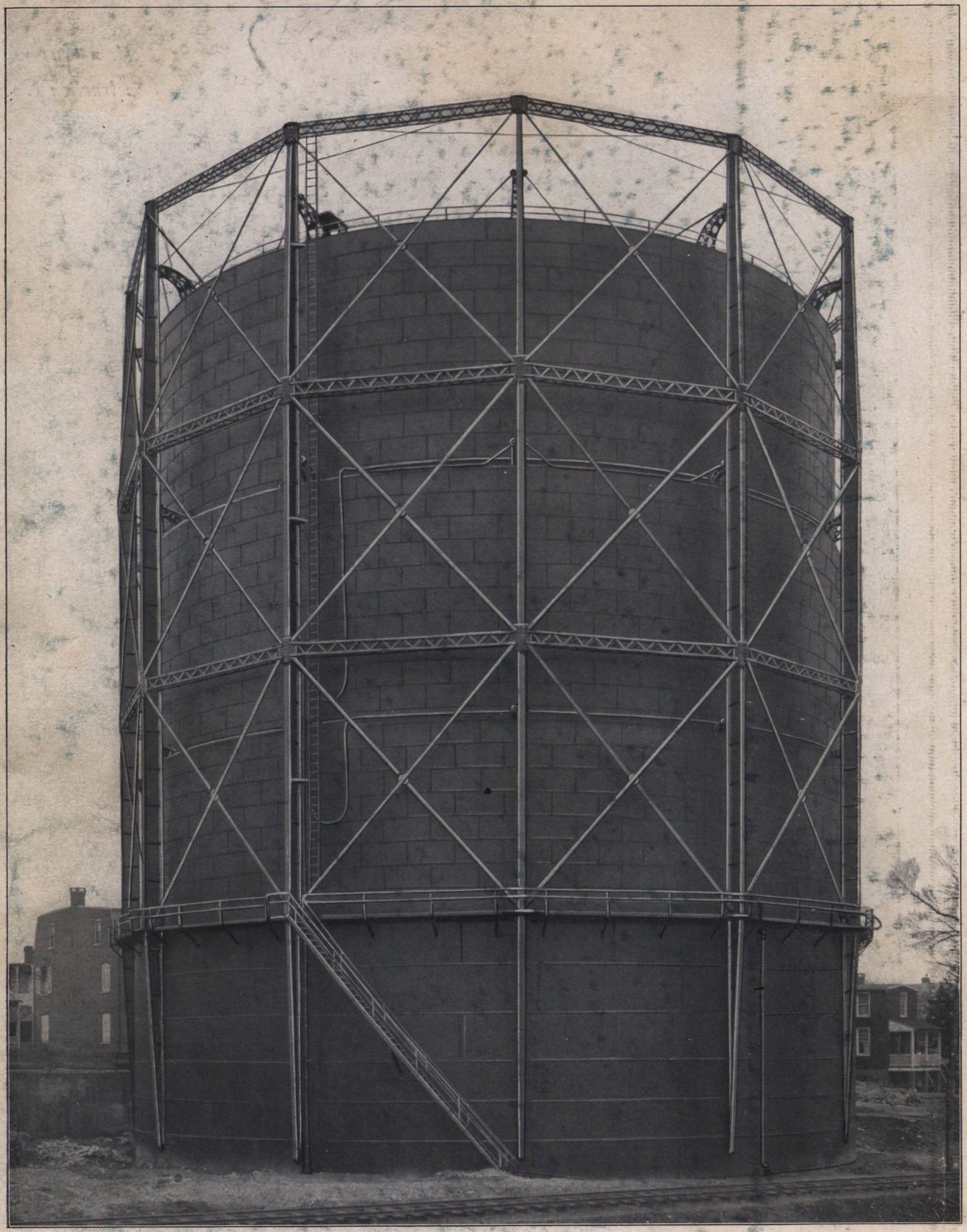
The foundation for this holder was completed July 24th, and the holder was erected, tested, and painted complete November 22nd of the same summer.



CUT OF ONE OF OUR 50,000 CUBIC FOOT SINGLE LIFT HOLDERS SHOWING METHOD OF BRACING SINGLE SECTION GUIDE FRAMES.



Cut of a Two Lift 200,000 Cubic Foot Holder, illustrating
Our Two Section Guide Frame.



Cut of a Three-Quarter Million Cubic Foot Three Lift Holder, Erected by us Complete in 106 Days After Foundation was Completed. Deducting 14 Sundays makes 92 Working Days to Complete the Job.